

This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

**As rescanning documents *will not* correct images,
please do not report the images to the
Image Problem Mailbox.**



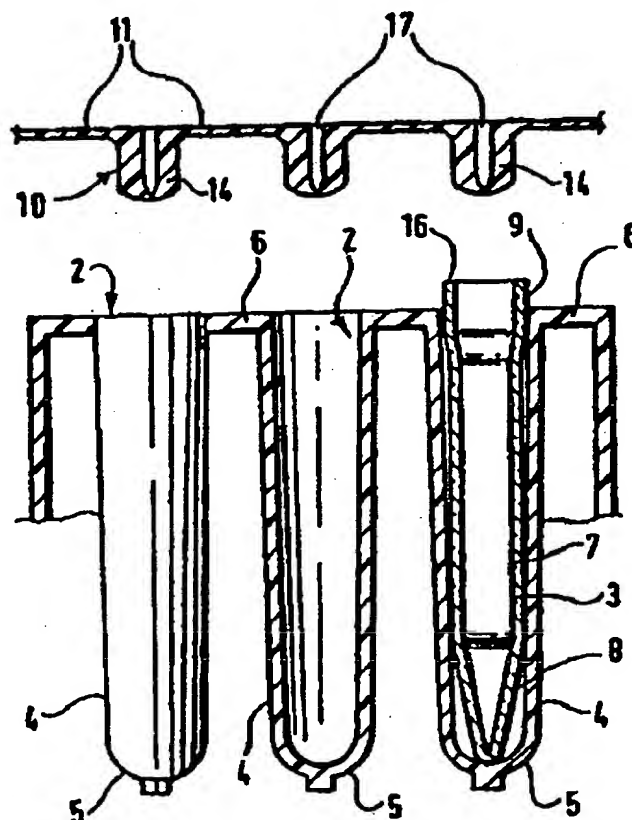
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : B01L 3/14	A1	(11) International Publication Number: WO 99/44745 (43) International Publication Date: 10 September 1999 (10.09.99)
<p>(21) International Application Number: PCT/GB99/00535</p> <p>(22) International Filing Date: 22 February 1999 (22.02.99)</p> <p>(30) Priority Data: 9804383.9 3 March 1998 (03.03.98) GB</p> <p>(71) Applicant: CHROMACOL LIMITED [GB/GB]; Glen Ross House, 3 Mundells Industrial Centre, Welwyn Garden City, Hertfordshire AL7 1EW (GB).</p> <p>(72) Inventor: COOK, Charles, David; 5 The Foxgloves, Boxmoor, Hemel Hempstead, Hertfordshire HP1 2DD (GB).</p> <p>(74) Agent: SAUNDERS & DOLLEYMORE; 9 Rickmansworth Road, Watford, Hertfordshire WD1 7HE (GB).</p>		<p>(81) Designated States: AU, CA, JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published With international search report.</p>

(54) Title: CLOSURE PLUG ARRAY WITH BLIND BORES

(57) Abstract

A closure means for a plurality of containers (3) in an array comprises a plurality of plugs (10) in a corresponding array with each plug having a blind bore for the penetration of a sampling needle.



- 1 -

CLOSURES**CLOSURE PLUG ARRAY WITH BLIND BORES**

5 In fields such as combinatorial chemistry and autosampling, it is well known for a large number of containers or vessels to be held in a regular array of rows and columns or in concentric circles.

 In life science chemistry, for example, it is known to use a moulded block formed with
10 an array of wells, each well forming a container for a different combination of chemicals. It is known to provide a lid for such a block which is in the form of a fairly stiff mat formed with an array of plugs for closing the wells. The blocks are usually moulded from plastic material but in combinational chemistry where the chemicals being analysed are often incompatible with this (such as when organic solvents are involved), it has been proposed to form the block from
15 glass, or to provide a glass vial as a liner to each well. In the latter solution, each glass vial is provided with its own separate cap (which may be a crimp cap or a snap-fitting cap) which must be individually fitted to the vial. When a needle is inserted through the cap to remove a sample from the vial, it is gripped by the cap and the vial tends to be withdrawn from the block when the needle is being removed.

20

 The invention sets out to provide an improved closure means for such an array of containers.

- 2 -

According to the invention, there is provided closure means for a plurality of containers in an array comprising a plurality of container closures in a corresponding array with each closure connected to adjacent closures and being formed as a plug for insertion into a corresponding container and having a blind bore for the penetration of a sampling needle
5 through the plug.

Embodiments of the invention are described below with reference to the accompanying drawings, in which:

- Figure 1 is a partial view of a well block with vials inserted into some of the wells;
10 Figure 2 is a partial vertical cross-section through well block and a sheet of closures;
Figure 3 is a partial view from above of a sheet of closures;
Figure 4 is a partial view from below of a sheet of closures; and
Figure 5 is a vertical cross-section through a closure in the top of a vial on an enlarged
scale.

15

One corner of a moulded well block 1 is shown in Figure 1. The block is provided with an array of wells 2 regularly spaced in rows and columns. Only some of the wells are shown in Figure 1 as having containers in the form of glass vials 3 located therein although, in general, all the wells will contain a vial. Part of the head of each vial 3 can be seen to protrude from its
20 well 2 in Figure 1. A typical block will comprise 24, 96, 384 or 1536 wells in an array of rows and columns in multiples of 8 and 12.

Figure 2 shows a cross-section through three wells of the block. As can be seen, each

- 3 -

well 2 is formed as a slightly tapering tube 4 with a closed bottom 5 and an open top. The tubes 4 are connected together by the upper wall 6 of the block.

5 A vial 3 is shown in one of the wells 2 and has a generally cylindrical main body part 7 a tapered bottom 8 and a slightly enlarged head 9 which helps the vial locate snugly in the upper end of the well. The provision of the head 8 allows the overall depth of the wells to vary slightly without interfering with the snug fit of the vials. In the case of the vial shown, the head 8 is not so enlarged as to permit a crimped cap to be fitted thereto.

10 A closure means for closing all the vials held in the block is partly shown in Figure 2, 3 and 4 and comprises a plurality of container closures 10 in an array corresponding to that of the wells and vials. The individual closures are connected to each other by connection means provided by connecting straps 11 and a very thin membrane 12 to form a sheet or web of closures which is moulded as a single piece with a relatively thick outer boundary wall 13
15 which helps keep it in shape. The straps 11 are in the form of thin strips which can be easily cut with a knife etc or snipped through with scissors. The straps serve to keep the plugs correctly positioned relative to one another.

As can be seen in Figures 2, 4 and 5, the closures 10 are in the form of plugs which are
20 a push fit into the heads of the vials and consist of a lower cylindrical portion 14 which fits into the open end of a vial and an upper cylindrical portion 15 which has a greater outer diameter than the lower portion 14 and overlies the upper end wall 16 of the vial.

- 4 -

The central blind bore 17 in the plug is provided for the penetration of a sampling needle through the plug. The plug may be made of a number of materials according to the application, such as silicone elastomer, natural or synthetic rubber, polyethylene and polypropylene. A thin protective layer (not shown) of PTFE or other inert material is provided
5 on the outer surface of the plug on the underside of the sheet to prevent reaction between the plug and the contents of the vial. In practice, a thin sheet of PTFE is put into the mould with the sheet of silicone elastomer or other material which is used to form the web. Thus, the whole under surface of the sheet is covered by a thin coating of PTFE and the membrane 12 is largely formed thereby.

10

Although described in combination with a well block carrying glass vials, the closure means may be used in any application where a plurality of containers are held in an array, such as for example in autosampling. The closure means might also be used with a block of wells not provided with vial inserts. In this case, the plugs would fit directly into the wells 2.

15

The sheet of closures can be fitted to an array of containers purely by hand or with the use of mechanical assistance. Samples can be taken from any one of the vials by inserting a needle through the plug via the blind bore 17. Although the needle will be slightly gripped as it is withdrawn, the plug will be retained in position by virtue of its connection to the rest of the
20 sheet of closures. When it is required to remove any individual container, this can be readily achieved by snipping through the straps and membrane connecting the selected closure. The container and its closure can then be removed from the array without affecting any of the other containers in the array. A tool having an annular cutting edge may be provided for this

- 5 -

purpose.

The block 1 and the sheet of closures are each provided with cut-away corners 18, 19 to assist in registration.

5

The sheet will normally be provided with an array of rows and columns corresponding to those of the block but as an alternative may be formed as a strip of one or more rows so that each sheet will cover only part of a block.

10

The membrane 12 may assist when it is required to move all the vials from one block to another. In this case, a flat platen can be applied to the upper surface of the web and a vacuum applied through the platen to the membrane for lifting the web and all its associated vials from the block and transporting them to an alternative block.

- 6 -

CLAIMS

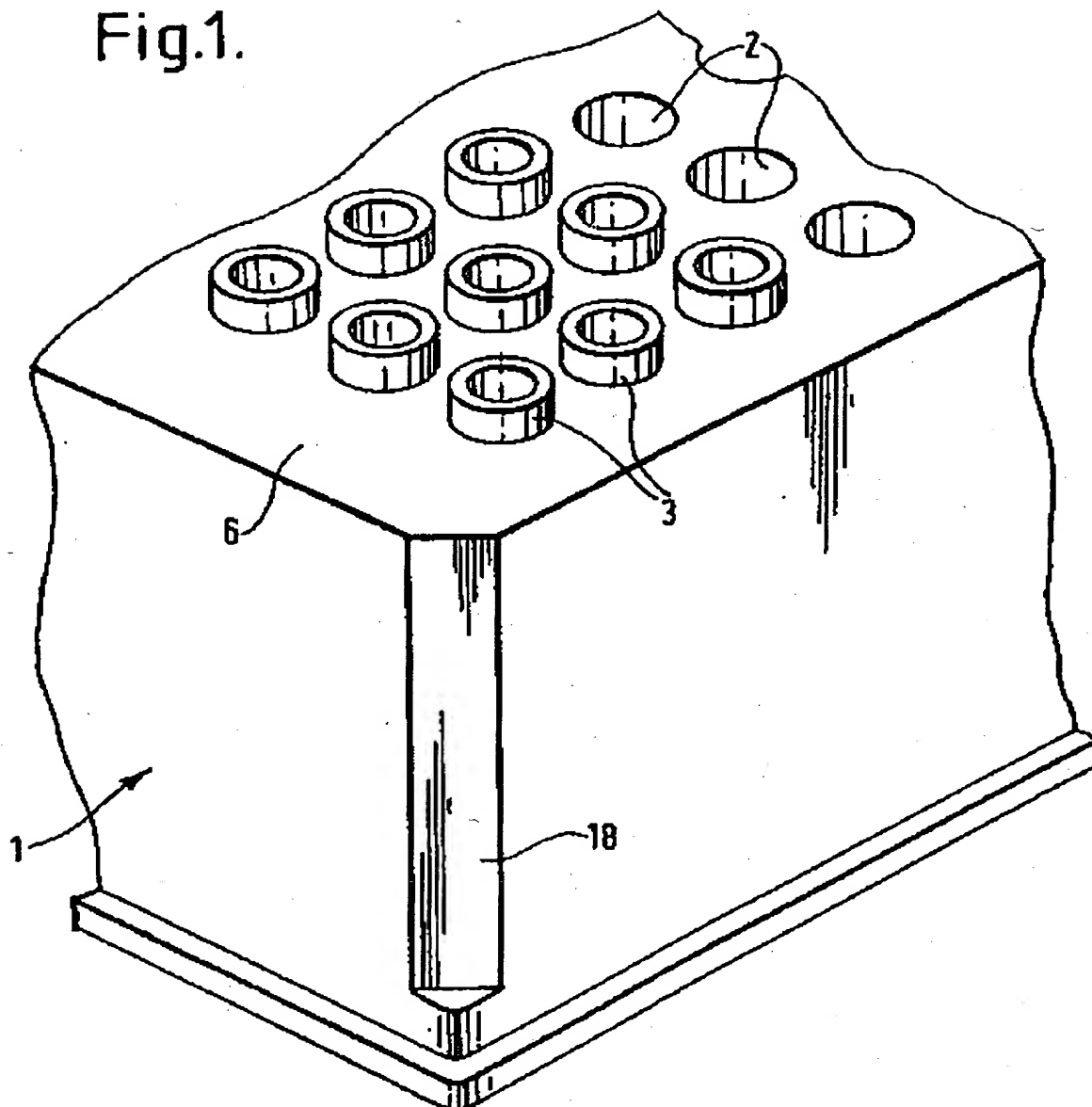
1. Closure means for a plurality of containers in an array comprising a plurality of container closures in a corresponding array with each closure connected to adjacent closures
5 and being formed as a plug for insertion into a corresponding container and having a blind bore for the penetration of a sampling needle through the plug.
2. Closure means as claimed in Claim 1 in the form of a sheet moulded in a single piece from an elastomer.
- 10 3. Closure means as claimed in Claim 1 or Claim 2, wherein a protective layer of an inert material is provided on the outer surface of the plug on the underside of the sheet.
4. Closure means as claimed in any preceding claim, wherein each closure is connected to
15 adjacent closures by connecting straps.
5. Closure means as claimed in any preceding claim, wherein each plug is formed by a lower cylindrical portion adapted to fit into the open end of a container and an upper cylindrical portion having a greater outer diameter than the lower portion and adapted to
20 overlie the upper end wall of the container.
6. Closure means for a plurality of containers in an array substantially as described herein with reference to the accompanying drawings.

- 7 -

7. Closure means as claimed in any preceding claim in combination with a plurality of vials supported in an array of rows and columns in a block formed with a corresponding array of wells for receiving and supporting the vials.

1/4

Fig.1.



2/4

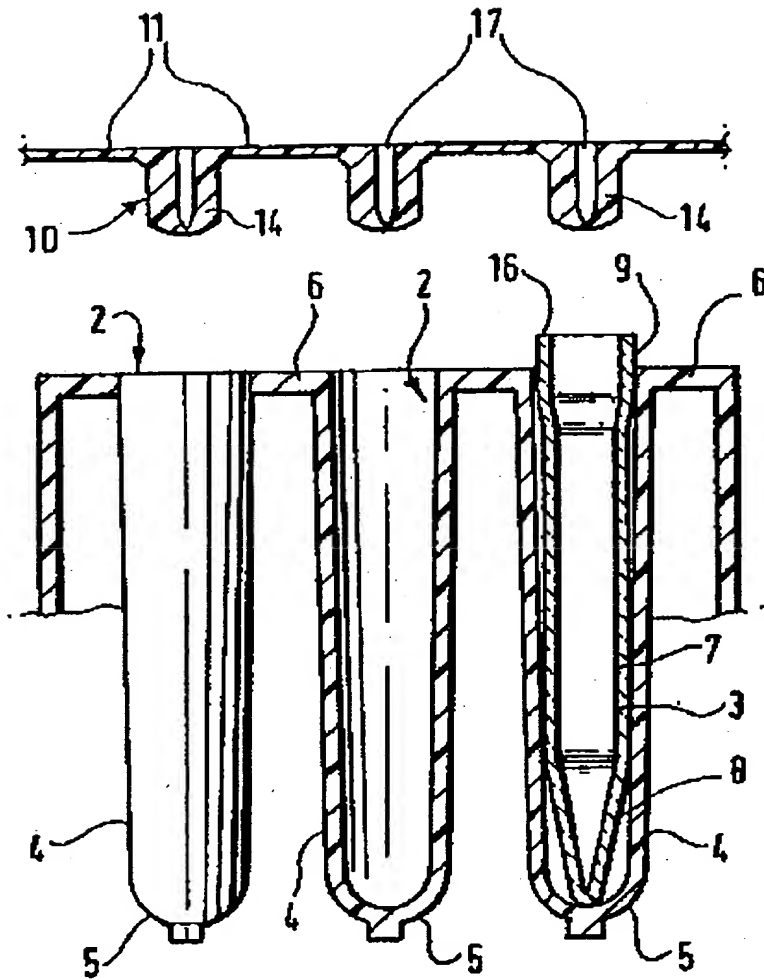


Fig.2.

3/4

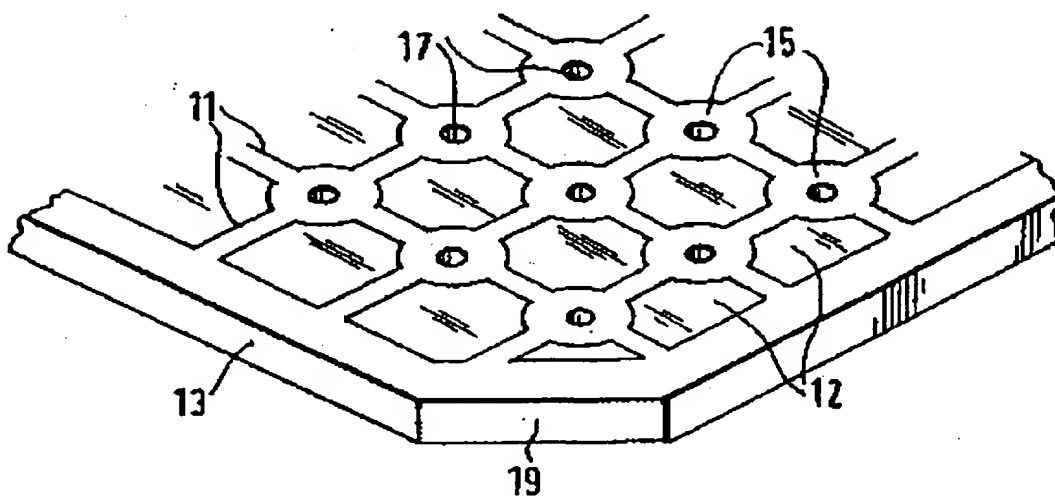


Fig.3.

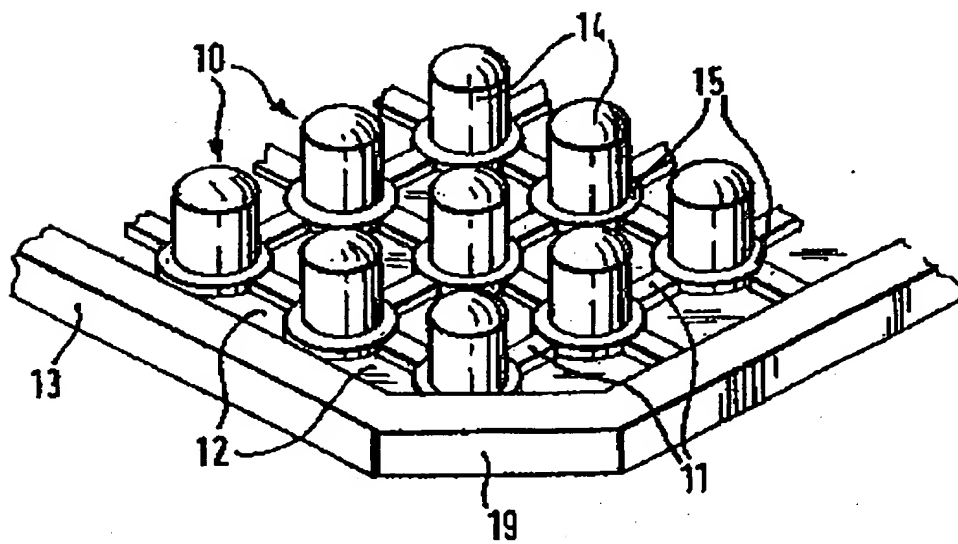


Fig.4.

4/4

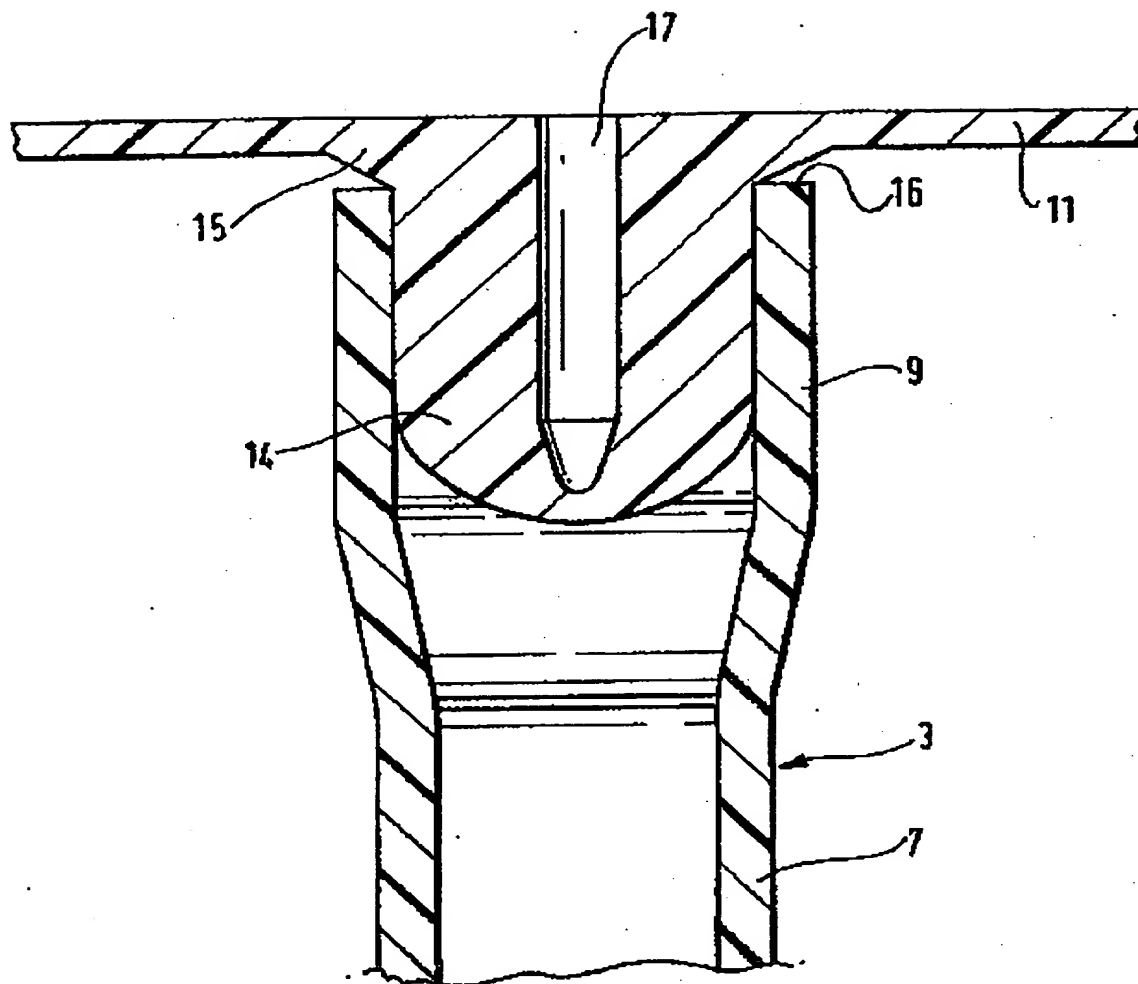


Fig.5.

INTERNATIONAL SEARCH REPORT

Int. J. Application No.
PCT/GB 99/00535

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B01L3/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B01L

Documentation searched other than international documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 285 496 A (IRE MEDGENIX SA) 5 October 1988 see column 3, line 65 - column 5, line 26 see figures 1-4	1,2,5,6
X	US 4 960 219 A (JORDAN WILLIE W ET AL) 2 October 1990 see column 1, line 6 - column 1, line 15 see column 3, line 26 - column 4, line 3 see column 4, line 42 - column 6, line 37 see figures 1-8	1,6,7
X	US 5 720 406 A (FASSBIND WALTER ET AL) 24 February 1998 see column 1, line 56 - column 2, line 42 see column 3, line 35 - column 4, line 34 see column 5, line 54 - column 6, line 41 see figures 7-12	6
A		1-4,7
	--- -/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- 'A' document defining the general state of the art which is not considered to be of particular relevance
- 'E' earlier document but published on or after the international filing date
- 'L' document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- 'O' document referring to an oral disclosure, use, exhibition or other means
- 'P' document published prior to the international filing date but later than the priority date claimed

- 'T' later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- 'X' document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- 'Y' document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- 'A' document member of the same patent family

Date of the actual completion of the international search

12 May 1999

Date of mailing of the international search report

25/05/1999

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Koch, A

INTERNATIONAL SEARCH REPORT

Int. Patent Application No.
PCT/GB 99/00535

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 632 396 A (BURNS JAMES A) 27 May 1997 see column 7, line 4 - column 7, line 42 see figures 9,10	1